

## REMARKS

Claims 1-37 were previously pending in this patent application. Claims 1-37 stand rejected. Herein, Claims 1, 6, 13, 22, 28, and 33 have been amended. Support for the amendments is found on page 4 of the Specification. Accordingly, after this Amendment and Response, Claims 1-37 remain pending in this patent application. Further examination and reconsideration in view of the claims, remarks, and arguments set forth below is respectfully requested.

## SPECIFICATION

According to the Office Action, the abstract was objected to. Herein, the abstract has been corrected.

## 35 U.S.C. Section 102(e) Rejections

Claims 1-5, 13-16, and 22-37 stand rejected under 35 U.S.C. 102(e) as being anticipated by Shibayama et al., U.S. Patent Application Publication No. US2003/0014602 (hereafter Shibayama). These rejections are respectfully traversed.

Independent Claim 1 recites (as amended):

A data cache comprising:

a plurality of cache lines, each cache line including a state indicator for indicating anyone of a plurality of states, wherein said plurality of states includes a speculative state to enable keeping track of speculative modification to data in said respective cache line, wherein said speculative state enables ***a speculative modification*** to said data in said respective cache line ***to be made permanent in response to a first operation performed upon reaching a particular instruction boundary during speculative execution of instructions***, and wherein said speculative state enables ***said speculative modification*** to said data in said respective cache line ***to be undone in response to a second operation performed upon failing to reach said particular instruction boundary during speculative execution of instructions***. (emphasis added)

It is respectfully asserted that Shibayama does not disclose the present invention as recited in Independent Claim 1. In particular, Independent Claim 1 recites the limitations, "wherein said speculative state enables ***a speculative modification*** to said data in said respective cache line ***to be made permanent in response to a first operation performed upon reaching a particular instruction boundary during speculative execution of instructions***," (emphasis added), and "wherein said speculative state enables ***said speculative modification*** to said data in said respective cache line ***to be undone in response to a second operation performed upon failing to reach said particular instruction boundary during speculative execution of instructions***," (emphasis added). In contrast, Shibayama discloses that the speculation flag (which indicates that the data of the cache line includes speculative data) is reset (to indicate that the data of the cache is not speculative data) when the speculative execution of the self-thread becomes definitive. [Shibayama; paragraph 0087]. However, Shibayama does not show that the

speculative state enables a speculative modification to the data in the respective cache line to be made permanent in response to a first operation performed upon reaching a particular instruction boundary during speculative execution of instructions, as in the invention of Independent Claim 1.

Further, Shibayama discloses that upon the detection of a flow dependence violation, a recovery process for the failure of the speculative execution of an instruction is initiated, wherein the recovery process involves canceling executed instructions and retrying executed instructions. [Shibayama; Figure 8 (element 278); paragraphs 0187-0189]. However, Shibayama fails to describe that the speculative state enables the speculative modification to the data in the respective cache line to be undone in response to a second operation performed upon failing to reach the particular instruction boundary during speculative execution of instructions, as in the invention of Independent Claim 1. Therefore, it is respectfully submitted that Independent Claim 1 is not anticipated by Shibayama and is in condition for allowance.

Dependent Claims 2-5 are dependent on allowable Independent Claim 1, which is allowable over Shibayama. Hence, it is respectfully submitted that Dependent Claims 2-5 are patentable over Shibayama for the reasons discussed above.

With respect to Independent Claims 13, 22, 28 and 33, it is respectfully submitted that Independent Claims 13, 22, 28 and 33 recite similar limitations as in Independent Claim 1. In particular, Independent Claims 13, 22, 28 and 33 include the limitations, "***in response to a first operation performed upon reaching a particular instruction boundary during speculative execution of instructions,***" (emphasis added), and "***in response to a second operation performed upon failing to reach said particular instruction boundary during speculative execution of instructions,***" (emphasis added). Therefore, Independent Claims 13, 22, 28 and 33 are allowable over Shibayama for reasons discussed in connection with Independent Claim 1.

Dependent Claims 14-16, 23-27, 29-32, and 34-37 are dependent on allowable Independent Claims 13, 22, 28 and 33, respectively, which are allowable over Shibayama. Hence, it is respectfully submitted that Dependent Claims 14-16, 23-27, 29-32, and 34-37 are patentable over Shibayama for the reasons discussed above.

#### 35 U.S.C. Section 103(a) Rejections

Claims 6-10, 12, 17-19, and 21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shibayama et al., U.S. Patent Application Publication

No. US2003/0014602 (hereafter Shibayama) in view of Handy (The Cache Memory Book, 1998, pages 66 and 77-86) (hereafter Handy). These rejections are respectfully traversed.

It is respectfully asserted that the combination of Shibayama and Handy does not teach, motivate, or suggest the present invention as recited in Independent Claim 6. In particular, Independent Claim 6 recites the limitations, "wherein said speculative state enables ***a speculative modification*** to said data in said respective cache line ***to be made permanent in response to a first operation performed upon reaching a particular instruction boundary during speculative execution of instructions,***" (emphasis added), and "wherein said speculative state enables ***said speculative modification*** to said data in said respective cache line ***to be undone in response to a second operation performed upon failing to reach said particular instruction boundary during speculative execution of instructions,***" (emphasis added). In contrast, Shibayama discloses that the speculation flag (which indicates that the data of the cache line includes speculative data) is reset (to indicate that the data of the cache is not speculative data) when the speculative execution of the self-thread becomes definitive. [Shibayama; paragraph 0087]. However, Shibayama does not show that the speculative state enables a speculative modification to the data in the respective cache line to be made permanent in response to a first operation performed upon reaching a particular instruction

boundary during speculative execution of instructions, as in the invention of Independent Claim 6.

Further, Shibayama discloses that upon the detection of a flow dependence violation, a recovery process for the failure of the speculative execution of an instruction is initiated, wherein the recovery process involves canceling executed instructions and retrying executed instructions. [Shibayama; Figure 8 (element 278); paragraphs 0187-0189]. However, Shibayama fails to describe that the speculative state enables the speculative modification to the data in the respective cache line to be undone in response to a second operation performed upon failing to reach the particular instruction boundary during speculative execution of instructions, as in the invention of Independent Claim 6. Moreover, Handy fails to teach, suggest, or motivate the cited claim limitations of Independent Claim 6. Therefore, it is respectfully submitted that Independent Claim 6 is patentable over the combination of Shibayama and Handy and is in condition for allowance.

Dependent Claims 7-10 and 12 are dependent on allowable Independent Claim 6, which is allowable over the combination of Shibayama and Handy. Hence, it is respectfully submitted that Dependent Claims 7-10 and 12 are patentable over the combination of Shibayama and Handy for the reasons discussed above.

Further, Independent Claim 13 is patentable over the combination of Shibayama and Handy and is in condition for allowance for the reasons discussed with respect to Independent Claim 6. Dependent Claims 17-19 and 21 are dependent on allowable Independent Claim 13, which is allowable over the combination of Shibayama and Handy. Hence, it is respectfully submitted that Dependent Claims 17-19 and 21 are patentable over the combination of Shibayama and Handy for the reasons discussed above.

Claims 11 and 20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Shibayama et al., U.S. Patent Application Publication No. US2003/0014602 (hereafter Shibayama) in view of Official Notice. These rejections are respectfully traversed.

Dependent Claims 11 and 20 are dependent on allowable Independent Claims 6 and 13, respectively, which is allowable over Shibayama. Moreover, the Official Notice fails to teach, suggest, or motivate the cited claim limitations of Independent Claims 6 and 13. Hence, it is respectfully submitted that Independent Claims 6 and 13 are patentable over the combination of Shibayama and Official Notice for the reasons discussed above. Since Dependent Claims 11 and 20 depend from Independent Claim 6 and 13, respectively, it is respectfully

submitted that Dependent Claims 11 and 20 are patentable over the combination of Shibayama and Official Notice for the reasons discussed above



### CONCLUSION

It is respectfully submitted that the above claims, arguments, and remarks overcome all rejections. All remaining claims (Claims 1-37) are neither anticipated nor obvious in view of the cited references. For at least the above-presented reasons, it is respectfully submitted that all remaining claims (Claims 1-37) are in condition for allowance.

The Examiner is urged to contact Applicants' undersigned representative if the Examiner believes such action would expedite resolution of the present Application.

Please charge any additional fees or apply any credits to our PTO deposit account number: 23-0085.

Respectfully submitted,

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